

Name: _____

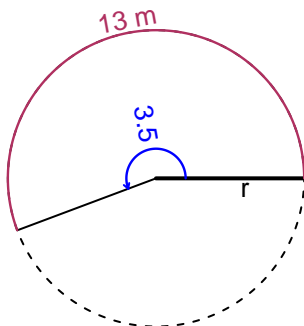
Date: _____

Trig Final (SLTN v608)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.5 radians. The arc length is 13 meters. How long is the radius in meters?

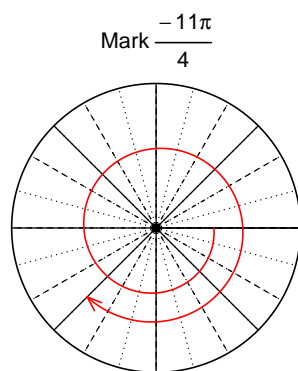


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 3.714$ meters.

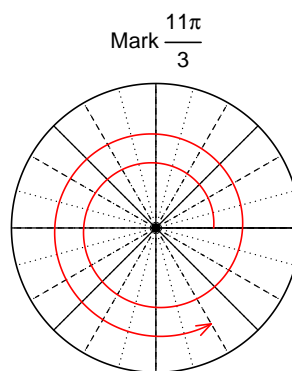
Question 2

Consider angles $-\frac{11\pi}{4}$ and $\frac{11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{11\pi}{4}\right)$ and $\cos\left(\frac{11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/4)$

$$\sin(-11\pi/4) = -\frac{\sqrt{2}}{2}$$



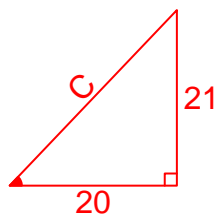
Find $\cos(11\pi/3)$

$$\cos(11\pi/3) = \frac{1}{2}$$

Question 3

If $\tan(\theta) = \frac{21}{20}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

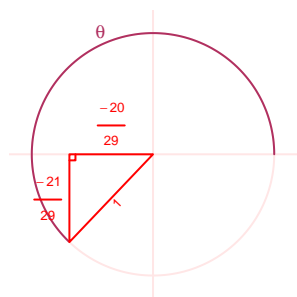
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}20^2 + 21^2 &= C^2 \\ C &= \sqrt{20^2 + 21^2} \\ C &= 29\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-21}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.71 meters, a frequency of 4.47 Hz, and a midline at $y = -3.08$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.71 \sin(2\pi 4.47t) - 3.08$$

or

$$y = -8.71 \sin(8.94\pi t) - 3.08$$

or

$$y = -8.71 \sin(28.09t) - 3.08$$